Key skills for the 21st century: An evidence-based review

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Abstract

It is vital that education systems deliver quality outcomes for all young people and prepare them well for their future in the economy and society. To do so, many systems have traditionally had a strong focus on developing academic skills, particularly in literacy and numeracy. In recent years, education systems have developed greater expectations that schools will also equip young people with a broader set of skills for the 21st century (e.g. creativity, critical thinking, problem-solving). This paper addresses these developments and the challenges they present. Building on an evidence-based review, this paper asks what are the key skills required for the 21st century? How do various jurisdictions articulate their aspirations concerning these broader skills within their curricular and policy frameworks? What evidence is there about the best way to incorporate key skills for the 21st century into curriculum and teaching and learning? How can a more diverse set of skills be measured and assessed?

Introduction

Many countries articulate ambitions to improve the way students develop 'a comprehensive set of cognitive, social and emotional capabilities to better face the socio-economic challenges of the 21st century' within education policies and reform objectives (OECD, 2015, p.130). This paper discusses four key questions for education systems responding to the challenge of developing key skills for the 21st century. These questions concern 1) the nature of these skills, 2) their integration into education systems' curricular and policy frameworks, 3) evidence on best practice for teaching and learning, and 4) measurement and assessment.

1 What are the key skills required for the 21st century?

Efforts to empower all students to develop a comprehensive range of competencies have a long tradition in Australia and overseas. Over 45 years ago, the Karmel report expected all students to learn

> … to be able to relate to others, to enjoy the arts both as a participant and as a patron, to acquire physical grace and to exercise developed mental powers in all aspects of living … as means to a more generous and fulfilling life (1973, p. 24).

Debates about the conceptualisation of these competencies have taken place and are still evident in the literature. In our review of key skills for the 21st century, and leaving aside technological skills that have received separate attention, we identified nine skills figuring prominently in this space (Lamb, Maire & Doecke, 2017). Critical thinking, creativity and problem-solving are skills that are directly applicable to performing tasks or creating products. To support the use of these competencies, students also depend on 'second-order' dispositions and skills that relate to how students learn and participate. These include metacognition, motivation, conscientiousness and grit.

Underpinning any meaningful engagement is students' sense of self-efficacy; that is, their belief that their application and efforts can make a difference. Finally, students' collaborative skills are considered to be increasingly important in solving complex problems or finding solutions to issues relevant to their communities.

These nine dispositions and skills have received attention primarily for their relationship with student achievement in school. Various frameworks have attempted to map the ways in which these attributes are interrelated, based on theoretical premises (Pellegrino & Hilton, 2012) as well as on empirical grounds (Lamb, Jackson, & Rumberger, 2015). Yet, it remains unclear how these skills are interrelated in shaping student learning, for theoretical (Coleman & Cureton, 1954) as much as measurement reasons (Farrington et al., 2012).

Beyond definition and classification controversies, however, research on 21st-century skills suggests that these attributes can be developed by individuals, albeit to a varying extent in different contexts. Accordingly, their development in schools is most likely to be nurtured by deliberate approaches to teaching and learning, where students are given rich and varied opportunities to improve them.

2 How do jurisdictions articulate their aspirations concerning these broader skills within their curricular and policy frameworks?

Increasingly countries remodel their curriculum frameworks in order to place these skills front and centre (Schleicher, 2018). Australia is well-recognised for the inclusion of general capabilities such as critical and creative thinking within the Australian Curriculum. Certain states in the United States, some Canadian provinces, New Zealand, Finland and Singapore are also leading in their developments in this area (ACARA, 2019). However, a common trend is that very little is

formalised beyond the curriculum, especially in terms of teaching and learning practices to develop a broader set of skills (Care & Luo, 2016).

One jurisdiction that has orientated itself towards social–emotional skills is the state of California, where eight of its largest school districts have formed a coalition, called the CORE Districts. A major focus of this coalition is the development of the four social–emotional skills of growth mindsets, self-efficacy, self-management and social awareness. The CORE Districts promote their importance through additional resources provided to schools. They place value on collecting a rigorous measure of students' skill development within their School Quality Improvement System (Krachman et al., 2016).

The CORE Districts conduct a student survey to gather self-reported measures of all four social–emotional skills. Evaluations of the CORE Districts' work in this area find that assessment of social–emotional skills demonstrates strong correlation in the 'expected direction with other academic and behavioural outcomes', with acceptable levels of internal reliability (Gehlbach & Hough, 2018; Krachman, Arnold, & Larocca, 2016; Transforming Education, 2016; West, 2016).

3 What evidence is there about the best way to incorporate key skills for the 21st century into curriculum and teaching and learning?

Part of the reason for the lack of detailed models for teaching 21st-century skills is the scarcity of evidence on best practice. As Binkley et al. (2012) note, our understanding of the acquisition of the different dispositions and skills in school remains thin, especially for the skills often labelled as 'non-cognitive' (i.e. intrapersonal and interpersonal skills). The difficulty in identifying how students build these skills makes it difficult to determine how best to teach them.

Nevertheless, a number of promising teaching methods have been considered. Chu and colleagues (2017) have recently focused on inquiry-based learning. This approach to learning encourages students to take responsibility for their own learning, linking with the 'second-order' skills listed (i.e. metacognition, motivation, conscientiousness and grit). In turn, this calls for appropriate support from teaching and non-teaching (e.g. library) staff and resources. The authors particularly highlight the central role technology-rich environments can play in inquiry-based learning.

Creative problem-solving was one of the key areas of the Programme for International Student Assessment (PISA) 2012 (OECD, 2014). Results from this large-scale international assessment highlight the importance of solving problems in meaningful contexts, the use of metacognitive (i.e. self-regulated learning) strategies and the value of subjects such as visual arts in helping students develop problem-solving skills. For PISA 2015, the OECD assessed collaborative problem-solving (OECD, 2017). International results suggest that social activities, safe and supportive school environments and physical education can play an important role in helping students collaborate. Exposure to student diversity in classroom learning can also foster the development of collaboration. Saavedra and Opfer (2012) similarly emphasise the importance of relevance, disciplinary-based learning and the use of thinking skills for the development of 21st-century skills.

As these examples suggest, existing evidence on teaching for 21st-century skill development points to strategies and methods that are characteristic of good schools and teaching more generally. Further research focused on 21st-century skills' teaching and learning could help determine whether these are valid across all skills and assist in making informed judgements about the relative merits of different approaches.

4 How can a more diverse set of skills be measured and assessed?

Measuring any skill is a complex task. In particular, the theory and measurement of social–emotional skills is still very much 'in its infancy' (Whitehurst, 2016). Researchers are in general agreement that skills and educational constructs cannot be measured well without first having a clear understanding of what they are (Ananiadou & Claro, 2009; Soland, Hamilton, & Stecher, 2013). However, 21st-century skills are constructs that lack 'inherent measurement properties independent of human definition' (Care & Vista, 2017). Whitehurst (2016) states that 'within the domain of soft skills there is nothing remotely close' to the level of specificity as that outlined with a literacy standard. The lack of high-quality and robust measures is due to various factors, including the fact that these constructs overlap one another and transcend discipline areas in a way that traditional subject areas do not.

There are three methods of assessment and evaluation currently used to capture and measure key skills for the 21st century within education contexts. They are:

1. student self-rating
2. direct assessment
3. teacher judgement and reporting.

Self-rating is achieved through the use of a student survey constructed and administered in a standardised format, using multiple-choice items or open-ended

prompts (Lai & Viering, 2012). Direct assessment involves the administration of a test or task to demonstrate a student's mastery of a competency or skill. The 21st-century skills commonly measured via direct assessment include collaborative problem-solving and critical and creative thinking (e.g. OECD's PISA). Teacher judgement is the final method of assessing skill development. Assessing and evaluating students in either a formative or summative way is crucial to the role of teachers and is often articulated as a key criteria within the teacher professional standards (e.g. such as those specified by Australian Institute for Teaching and School Leadership).

Although each method of assessment has strengths, it is also important to keep in perspective their limitations (West et al., 2014). There is a constant need for reflexivity when it comes to measurement, as any approach should be continually evaluated to ensure it supports the targeted educational objectives. Currently, schools and teachers employ a mix of methods of assessment concerning more traditional academic skills. Many researchers have similarly argued that a mixed and complementary assessment approach is necessary for a broader set of skills (Duckworth & Yeager, 2015). Different methods of assessment tap into different aspects of a construct and provide a fuller perspective of student achievement. Employing different methods of assessment ensures that they can be complementary to one another and also helps in circumventing their methodological limitations (Kautz, Heckman, Diris, Weel, & Borghans, 2014).

Conclusion

In the first decades of the 21st century, a broad range of attributes, dispositions and skills are receiving considerable attention in educational research and policy. While most countries have developed a strong focus on 21st-century skills in their school education systems, this emphasis is more marked for high-level policy than through effective approaches for teaching and learning. Evidence on valid and reliable assessment is also limited. This calls for further investment in research on key skills for the 21st-century, focusing particularly on teaching, learning and assessment.

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